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those described in Catalytic Cracking of Heavy Petroleum Fractions, Daniel DeCroocq, Institut Français du Pétrole, 1984 (ISBN 2-7108-455-7), pages 100-114. Preferably the apparatus is used in an FCC process wherein a gas solids suspension is fed to the primary cyclone having a solids content of between 0.5 and 15 and more preferably between 1 and 12 kg/m³.

The invention shall be illustrated by the following non-limiting examples.

Example 1

To a separation apparatus as described in Figure 1 a gas-solids suspension was fed having the properties as listed in Table 1. The dimensions of the primary cyclone were so chosen that d₁ was 0.3 m and d₂ was 0.3 m.

Table 1.

average particle size (micron)	76
density of suspension (kg/m ³)	5.8
primary cyclone inlet velocity (m/s)	10
separation in-efficiency of the primary cyclone	0.04%
separation in-efficiency of the combined primary and secondary cyclones	0.4 ppm
pressure-drop (Pascal)	2500

Comparative Experiment A

Example 1 was repeated except that the primary cyclone was one of a state of the art design having a gas outlet conduit which protrudes downwardly through the roof of the cyclone housing. The bottom of the tangentially gas inlet and the opening of the gas outlet conduit were in the same horizontal plane. The top of the tangentially inlet and the roof of the cyclone housing in the same horizontal plane. The distance between the centre of the tangentially inlet and the frusto conical wall section was the same as in Example 1. Furthermore

the inlet velocity, the composition of the suspension and the dimensions of the secondary cyclone were the same. The results are presented in Table 2.

Table 2.

Average particle size (micron)	76
density of suspension (kg/m ³)	5.8
primary cyclone inlet velocity (m/s)	10
separation in-efficiency of the primary cyclone	0.9%
separation in-efficiency of the combined primary and secondary cyclones	3 ppm
pressure-drop (Pascal)	2200

Comparative Experiment B

Experiment A was repeated except that the primary cyclone was the same state of the art design however improved in efficiency by narrowing the inlet-ducting of the primary cyclone. All other dimensions and operational data were kept the same. The results are presented below in Table 3.

Table 3.

Average particle size (micron)	76
density of suspension (kg/m ³)	5.8
primary cyclone inlet velocity (m/s)	20
separation in-efficiency of the primary cyclone	0.01%
separation in-efficiency of the combined primary and secondary cyclones	1 ppm
pressure-drop (Pascal)	3500

By comparing the results from Example 1 with Experiment A and Experiment B with A it is apparent that in both situations the separation efficiency is enhanced of the primary cyclone. Furthermore the combined separation in-efficiency of the primary cyclone and the secondary

cyclone of Experiment B is reduced by a factor 3 as compared to Experiment A at a considerable penalty in increase in pressure drop. With the apparatus according to the invention, as illustrated in Example 1, the combined separation in-efficiency is reduced almost ten-fold at a much lower increase in pressure drop when compared to Experiment A.

Example 2

Example 1 was repeated except that the primary cyclone did not have a dipleg at its lower end. Instead the lower end of the tubular housing consisted of a fluidized bed as illustrated in Figure 3. The fluidized bed level was kept below the vortex stabiliser. The particles of the fluidized bed are the same as the solids supplied to the primary cyclone. To this fluidized bed air was supplied as fluidizing gas. All of the air supplied to the fluidized bed zone was discharged from the primary cyclone via the gas outlet opening of the primary cyclone. Distances d_1 and d_2 were as in Example 1. More conditions and results are presented below in Table 4.

Comparative Experiment C

Example 2 was repeated except that the gas outlet conduit protrudes downwardly through the roof of the cyclone housing such that the bottom of the tangentially gas inlet and the opening of the gas outlet conduit were in the same horizontal plane and wherein the top of the tangentially inlet and the roof of the cyclone housing in the same horizontal plane. The distance between vortex stabiliser and gas inlet was as in Example 2. The fluidized bed level was kept below the vortex stabiliser as in Example 2. More conditions and results are presented below in Table 4.